The purpose of this article is to troubleshoot the electrical components of the transfer case system used on mid 1980s through 1996 vehicles. These vehicles use a separate transfer case control module. On later 4WD systems, which are controlled by a GEM module, see the May 2001 GEARs magazine article Another GEM of a Problem, written by Lance Wiggins. Since there are many versions of this system, please refer any mechanical transfer case or hub concerns to an appropriate repair data base or repair manual.

WARNING: The following items must be noted and corrected before attempting to operate or troubleshoot the 4WD system.

- The vehicle must be in good mechanical order
- You must be familiar with the correct operation of the specific system
- The vehicle must have four matched tires and correct tire pressure

For many years, Ford vehicles with electronic shifted 4WD used a small external electric motor to rotate a cam inside the transfer case.

For many years, Ford vehicles with electronic shifted 4WD used a small external electric motor to rotate a cam inside the transfer case. By rotating the cam, a shift fork moves back and forth to engage 2HI, 4HI or 4LO. Be aware that some models use automatic locking hubs while others use manual locking hubs.

Some of these vehicles have a Touch Shift or Shift on the Fly, which allows the driver to select 2HI or 4HI while in motion. To accomplish this, a magnetic clutch is energized to hold the 4WD sprocket. The transfer case control module then rotates the internal cam with the electric motor to lock the 4WD sprocket. Once the transfer case is in 4HI, the magnetic clutch is released.

On some systems, if the driver selects 4L while driving in 2HI, the transfer case control module will shift the transfer case to 4HI while the vehicle is moving. When the vehicle comes to a complete stop and the transmission gear selector is placed in Neutral, the transfer case control module will then select 4LO. On other systems, if the driver selects 4L while driving in 2HI, the 4LO indicator will flash until the vehicle comes to a complete stop and the transmission is put in Neutral. Then it will select 4LO without first going to 4HI.

It’s best to troubleshoot the system based on the symptoms. Based on one of six symptoms, you should be able to identify the problem and repair the vehicle.

SYMPTOM 1 – System seems off, nothing happens, lights off

Try unplugging the 8-pin square connector of the transfer case control module for a few minutes (figure 1). Reconnect it and see if the transfer case responds. If it does not, try the other symptoms. If the transfer case responds, then the electrical components are functioning correctly. If the transfer case does not respond, then the mechanical components may be at fault.

For many years, Ford vehicles with electronic shifted 4WD used a small external electric motor to rotate a cam inside the transfer case.
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case control module resets itself. If not, continue with the following tests. Use the PIN VOLTAGE CHART to check voltage and circuits (figure 2). Make sure the transfer case control module has power and ground. Check fuse 17 (most vehicles) for power to the LO and HI indicator bulbs. Disconnect the 8-pin flat connector (figure 3). Measure...
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the speed sensor resistance at connector pins 2 and 3. The resistance with the vehicle stopped should be 225-275 ohms. Reconnect the 8-pin plug.

Disconnect the 8-pin square connector. Measure the magnetic clutch resistance between the harness side pin 5 and ground. It should be 1.5-5.0 ohms. With the transfer case in 2WD and the engine off, apply 12 volts to the harness side of pin 5 for a second. The clutch should click to lock the 4WD sprocket.

At the 8-pin square connector, apply 12 volts to pin 4 and ground pin 6 for about one second (figure 3). The electric motor should rotate clockwise stopping at the 4L position. Reverse the polarity and the electric motor should rotate counterclockwise stopping at the 2H position. Reconnect the 8-pin square connector.

NOTE: It is common for the electric motor to wear out, fail from being submerged in water, or if the internal stops have broken off.

With all connectors plugged in, turn the ignition on. Back probe pin 1 of the 5-pin flat connector (figure 4). There should be five volts. Operate the 4HI and 4LO switches. Make sure the correct pin at the transfer case control module has five volts (see the PIN VOLTAGE CHART). Using a jumper wire, back probe and ground pin 4 of the 5-pin flat connector. The 4LO indicator light should come on. Back probe and ground pin 5 of the 5-pin flat connector. The 4HI indicator should come on.

To check the shift plate switches inside the electrical motor, make sure all connectors are plugged into the transfer case control module. Turn the ignition on and place the gear selector in Park or Neutral. Back probe the negative lead of your voltmeter to pin 8 of the 8-pin flat connector. Back probe the positive lead of your voltmeter to pin 4. Select each range and check for the correct voltage pattern of the switch plate input (see the PIN VOLTAGE TEST CHART).

You may have to operate the vehicle to engage each electric motor position. Repeat this test for the remaining pins 5, 6 and 7. If the electric motor won’t move, try energizing it with voltage as previously described. If the voltage does not match the chart, either the wiring is bad or the electric motor assembly is bad.

**If the electric motor won’t move, try energizing it with voltage as previously described. If the voltage does not match the chart, either the wiring is bad or the electric motor assembly is bad.**
SYMPTOM 2 – Won’t shift to 4LO
Make sure the speed sensor circuit is good. Make sure the module is getting a neutral signal from the MLPS or TR switch. If no problems were found during SYMPTOM 1 tests, replace the module.

SYMPTOM 3 - Transfer case control module clicking
Make sure the plate switches test good. See the PIN VOLTAGE TEST CHART. If the plate switch circuits are good, replace or repair the electric motor.

SYMPTOM 4 - Shifts by itself on startup
This may be caused by the plate switches indicating the electric motor is between positions, the motor is bad, or someone touched the shift button when the ignition was in the accessory position.

SYMPTOM 5 - Position lights display wrong range
Disconnect the module. See the PIN VOLTAGE CHART for the 4LO and 4HI indicator light circuits. Turn the ignition on. Using a jumper, jump the appropriate pins at the harness to ground. If each light works correctly, replace the module. If not, check the light circuits for shorts, opens or no feed voltage.

SYMPTOM 6 - Rough 2HI to 4HI shift
This symptom is usually caused by a weak magnetic clutch or internal transfer case problems.
As you can see, this system is very simple to understand and diagnose. When symptoms like these occur, following the six-symptom diagnostic procedures will help speed things up.